

STUDIES IN CYPERACEAE IN SOUTHERN AFRICA: V

Fimbristylis species of sections *Fimbristylis*, *Dichelostylis* Benth., and
Pogonostylis (Bertol.) Pax.†

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ABSTRACT

Descriptions, illustrations, and citations of representative Southern African and some Tropical African specimens of *Fimbristylis dichotoma*, *F. bisumbellata*, *F. squarrosa*, *F. ferruginea* and *F. longiculmis* are given. The occurrence of natural, sporadic interspecific hybrids between some pairs of these species is reported. The relationships of the species to one another are discussed and a key to identification provided.

INTRODUCTION

The species of *Fimbristylis* Vahl considered in this paper are *F. dichotoma* (L.) Vahl, *F. bisumbellata* (Forsk.) Bub., *F. ferruginea* (L.) Vahl, *F. longiculmis* Steud. and *F. squarrosa* Vahl. Kern (1955), in dealing with Asian Cyperaceae, referred the first two of these to the type section, *Fimbristylis*, characterized by spiral glumes, flat usually fimbriate, two-branched styles, trabeculate biconvex achenes, and leaves with the ligule either membranous or consisting of a dense fringe of short hairs. *F. ferruginea*, closely related, yet differing in the smooth, non-trabeculate achene, he placed in *Dichelostylis* Benth., while *F. squarrosa* was included within *Pogonostylis* (Bertol.) Pax, a section comprising plants without ligules and with small, angular spikelets. *F. longiculmis*, at present known only from Malagasy and Africa, was not considered, but because of close floristic relationships, it is best placed in *Dichelostylis* with *F. ferruginea*.

The descriptions and citations that follow are as in previous papers in this series (Gordon-Gray, 1966a, b).

3. *Fimbristylis dichotoma* (L.) Vahl in Enum. Pl. 2: 287 (1806); Fischer in Bull. Misc. Inf. 1935: 149 (1936); Hutch. in Fl. W. Trop. Afr. II (2): 474 (1936); Kern in Blumea 8 (1): 155, 160 (1955); Robyns & Tournay in Fl. des Sperm. du Parc Nat. Albert 3: 260 (1955); Koyama in Journ. Fac. Sci. Univ. Tokyo III 8 (3): 111 (1961); Podlech in Prod. Südwestafrika 165: 23 (1967).

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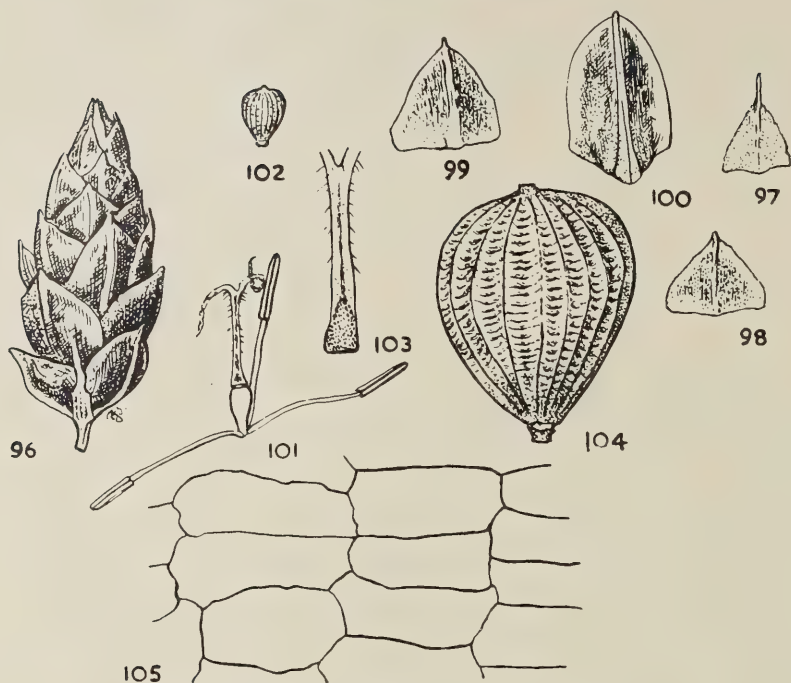


FIG. 8. *Fimbristylis dichotoma* (L.) Vahl (Ward 1678).

96—spikelet; 97–99—three lowest glumes of spikelet; 100—fifth glume from spikelet base; 101—young floret; 102—achene (all $\times 7$); 103—style base and style ($\times 14$); 104—achene ($\times 28$); 105—epidermal pericarp cells ($\times 196$).

F. diphylla (Retz.) Vahl in Enum. Pl. 2: 289 (1806); Nees in Linnaea 9: 290 (1834) name only; Bak. in Fl. Maurit.: 418 (1877) syn. *F. rigidula* excl.; Clarke in Fl. Brit. Ind. 6: 636 (1893) and in Dur. & Schinz, Consp. Fl. Afr. 5: 603 (1895); K. Schum. in Engl. Pfl. Ost. Afr.: 124 (1895); Clarke in Dyer Fl. Cap. 7: 200 (1893); Rendle in Cat. Afr. Pl. Welw. 2: 122 (1899); Clarke in Dyer Fl. Trop. Afr. 8: 417 (1902) and in Bull. Misc. Inf., Addit. Ser. 8: 107 (1908) name only and in Illus. Cyp. t. XLII f. 1, 2 (1909); Burtt Davy & Leerndertz-Pott in Ann. Tvl. Mus.: 132 (1912) name only; Eyles in Trans. Royal Soc. S.A.: 315 (1916) name only; Schonl. in S.A. Cyp., Mem. Bot. Survey S. Afr. 3: 33 (1922); de Wild. in Pl. Bequaert. 4: 201 (1927); Cherm. in Cat. Pl. de Madag. Mem. Acad. Malgache: 31 (1931); Brain in Proc. Rhod. Sc. Assoc. 33: 84 (1934); Peter in Fedde Rep. 40: 400 (1936–7); Cherm. in Fl. de Madag.

Cyperaceae: 178 (1937). *F. communis* Kunth in Enum. Pl. 2: 234 (1837) syn. quibusdam excl.; Ridl. in Trans. Linn. Soc., Ser. II, Bot. 2: 150 (1884) partly. *F. sechellensis* Bak. in Fl. Maurit: 418 (1877).

Scirpus dichotomus L. in Sp. Pl. ed. 1: 50 (1753); l.c. ed. 2: 74 (1762). *S. diphyllus* Retz. in Obs. Bot. VI: 15 (1791).

Fimbristylis dregeana Kunth in Enum. Pl. 2: 232 (1837) *Fimbristylis* × *dregeana* Kunth (pro species).

Annual, occasionally biennial or perennial, erect, up to 126 (usually 60–70, sometimes 28 or less) cm in height, sparsely tufted, sterile shoots infrequent: *rhizome* visible only when shoots broken apart, up to 5 mm wide, persistent leaf bases usually lacking; *leaf sheaths* well developed, terete, entire, splitting from mouth in age, glabrescent to densely white pilose (indumentum always better developed in upper half), keel generally rounded, many nerved, green to cream, membranous portion conspicuous when dry, nerveless, pallid to golden brown, usually darker speckled, mouth truncate, ciliate; *ligule* a dense fringe of white hairs; *blades* always developed, up to 36 cm long, $1.3\text{--}4.1$ (2.45 ± 0.15) mm wide, linear, herbaceous, glabrous adaxially, glabrescent abaxially, margins thickened to ridged, generally slightly involute, closely scabrid pubescent to smooth, apex obtuse occasionally broadly acute, scabrid: *flowering stems* erect, terete to slightly flattened especially below inflorescence, sparsely white pilose especially on angles and below inflorescence, occasionally glabrous: *inflorescence* up to 15 cm long, up to 10 cm wide, a compound “umbel” (anthela, Rickett, 1944) of ± 73 spikelets, often reduced, sometimes markedly so forming a simple “umbel” of ± 3 spikelets; *pedicels* up to 6 cm long, markedly flattened, glabrous, angles scabrid or smooth; *bracts* 2–4, usually 3, leaflike, generally equalling, occasionally shorter than or far exceeding inflorescence, sheaths densely white pilose, mouth faintly white ciliate, blades white pilose to scabrid pubescent: *spikelets* 4–11 (7.13 ± 0.41) mm long, 2–3 (2.69 ± 0.09) mm broad, compact, cylindric, scarcely angled by glume keels, elliptic to elliptic lanceolate when young, lanceolate ovate in age, acute, occasionally almost obtuse, shining chestnut brown with lighter markings, basal glumes early deciduous; *rachilla* straight, deeply notched, usually showing spiral arrangement of glumes, ragged due to persistent, acute, dark brown wings with pallid apices; *glumes*, lowest 1–2 sterile, bract-like, remainder fertile, 2.0–3.5 (2.95 ± 0.06) mm long, 1.7–3.3 (2.66 ± 0.08) mm in total width, broadly ovate to orbicular, shining chestnut red paling towards narrow membranous margin, glabrous, keel well defined, slightly projecting, of 3 veins excurrent into mucron, apex rounded, mucronate: *stamens* 3; *anthers* 0.7–1.1 (0.84 ± 0.02) mm long, yellow, crest minute, smooth, brownish: *style* 1.6–2.1 mm long including style base, 0.15–0.28 (0.2 ± 0.01) mm wide at narrowest point, ribbon-like, flattened in plane of achene, 3 nerved, margins long villous, style base

slightly wider than style; branches 2, shorter than style, flattened in plane of achene, tapering apically, margins fringed, hairs shrivelling with age: *achene* 0.9—1.24 (1.14 ± 0.02) mm long, 0.65—0.95 (0.76 ± 0.02) mm broad, biconvex, obovate to almost orbicular, apex minutely projecting, cream to yellow to dark brown-black eventually, surface with 6–9 prominent longitudinal ridges, trabeculate; gynophore just developed; *outermost cells to pericarp* transversely elongate, placed in longitudinal series, eventually velate (giving temporarily a white coloration to achene).

Flowering period: November to March inclusive.

TYPE: *Scirpus dichotomus* Linn. Sp. Pl., ed. 1: 50 (1753) is based on, “*Gramen parvum . . .*,” Herm. Zeyl.: 26 (1737) and “*Gramen Cyperoides Maderaspatanum, Juncelli Gesneris . . .*,” Pluk. Alm.: 179, t. 119, f.3 (1705). The types of both Plukenet and Hermann are preserved at the Herbarium of the British Museum of Natural History, London. They are identical (Fischer, 1936). Plukenet’s specimen, from India, is selected the lectotype of the species.

SELECTED CITATIONS

SUDAN. Seriba Ghattas, *Schweinfurth* 1464 (NH); Tinor River, *Schlechter* 6392 (GRA).

IVORY COAST. c. 115 km n. of Tabou on rd. to Tai, *de Wilde* 3596 (PRE).

GHANA. 2 ml. n.e. of Kwahu Tafo on rd. to Adawso, *Rose Innes* 30580 (PRE).

TOGO. prope Lome, *Warnecke* 138 (EA).

CONGO. National Albert Park, Volcano Rumoka 1,600 m. *Germain* 3681 (PRE); Plaine Rusizi, region de Luberisi, mont Kalambo, *Germain* 6286 (PRE).

UGANDA. Napak, Karamja, *Thomas* 3602 (EA); Bukedea, Bugwere, *Thomas* 3855 (EA); Serere, Teso, *Chandler* 723 (EA); 2 ml. along Gayaza rd. *coll. for Snowden* 2108 (EA); near Banda, *Dümmer* 1380 (PRE).

KENYA. Bukura, North Kavirondo, *Graham* 213 (EA).

TANZANIA. Mafia Island, Kilindoni, *Greenway* 5248 (EA, PRE); Morogoro distr: Bwakira-ya-ju, *Haarer* 1844 (EA); Hagga distr: Kilimandjaro Süd c. 1,500 ft. *Schlieben* 4611 (PRE); Moshi distr: Usangi, Upare, *Haarer* 814 (EA); Rufiji distr: without precise locality, *Musk* 112 (EA); Tanga distr: Amani, *Verdcourt* 175 (EA, PRE); Usaramo distr: Usambara, *Holst* 3743 (EA); districts unknown: Unyamwesi, Komba os Alich to Kaliuwa, *Peter* 35717 (EA); without precise locality: *Zimmerman* 7584 (EA).

ZAMBIA. Mweru distr: Chamfubu plain, Lake Mweru, *Vesey-Fitzgerald* 539 (RLCS); Alungu distr: Abercorn, Lake Chila, *Seagrief* 2281 (PRE); Kasama distr: Mungwi, *Robinson* 4072 (PRE, EARO); Mwinilunga distr: by river Matonchi, near garden, *Milne-Redhead* 2910 (PRE); Central distr:

Mkushi, Fiwila, *Robinson* 2716 (PRE, EARO); Mazabuka distr: Mazabuka, Simasunda, *Robinson* 2144 (NU, PRE); Batoka distr: Livingstone, n. bank of Zambesi river, *Rogers* 13004 (BOL).

MALAWI. Nyasa distr: Likubula Gorge, *Brass* 16386 (PRE); Banks Rukuru river, near lake, *Leech* 9 (PRE).

MOZAMBIQUE. Portobelo distr: Quelimane, *Sim* 20747 (NU); Zambesia: Island Jagarra, *Gomes Pedro* 2171 (LMJ); Buzi distr: Beira, *Rogers* 5947 (GRA, BUL); Chimoio distr: entre Pavua e Vila Pery, *Pedro & Pedrogao* 221 (LMJ); Dombe distr: entre Dombe e Mapira, a 18 km do Posto, *Gomes Pedro* 4453 (PRE); Sabie distr: Namaacha, *Grandvaux Barbosa* 76 (LM).

RHODESIA. Lomagundi distr: eastern Urungwe, *Phipps* 1001 (PRE); Salisbury distr: near Salisbury, Rua river, *Eyles* 1441 (SRGH, PRE); Wankie distr: Victoria Falls, rain forest, *Robinson* 1047 (EARO); Hartley distr: Hartley, Poole Farm, *Hornby* H2436 (SRGH); Marandellas distr: Marandellas, Grasslands Research Station, *Colville* 64 (SRGH, J); Makoni distr: Makoni, *Eyles* 2941 (PRE, SRGH, GRA); Inyanga distr: Inyanga, Chisire, Nyarakokwa river, *Norlindh & Weimarck* 4301 (PRE, BUL); Nyamdhlovu distr: Matundhlahamla vlei, *Pardy* 47 (SRGH); Melsetter distr: Melsetter, *Otterson* 38 (SRGH); Matobo distr: farm Quasinga, *Miller* 5239 (PRE).

SOUTH WEST AFRICA. E. Caprivi, Zipfel, about 8 miles from Katima Mulilo on road to Ngoma, *Killick & Leistner* 3042 (PRE); Damaraland, Waterberg Plateau, *Boss* s.n. (PRE).

BOTSWANA. Without precise locality, *Curson* 218 (PRE).

TRANSVAAL. Zoutpansberg distr: farm Zoutspan, *Obermeyer, Schweickerd & Verdoorn* 221 (PRE); Potgietersrust distr: Pyramid Estate, near Potgietersrust, *Galpin* 9106 (PRE, GRA); Pietersburg distr: Houtbosch, *Rehmann* 5623 (K, BOL); Waterberg distr: About 17 miles from Vaalwater on road to Hermanusdoorns, *Meeuse* 10525 (PRE); Letaba distr: Westfalia, confluence of Mtati and Ramadiepa rivers, *Scheepers* 381 (PRE); Lydenburg distr: farm Zwagershoek, *Obermeyer* 266 (PRE); Brits distr: Magaliesberg, Wolhuter's Kop area, *Killick* 1994 (PRE); Pretoria distr: 10 miles n.e. of Hammanskraal on Premier Mine rd, *Codd* 3513 (PRE); Belfast distr: Waterval Onder, *Jenkins* 6886 (PRE); Nelspruit distr: Nelspruit, *Breyer* s.n. (PRE); Krugersdorp distr: farm Gladysvale near Krugersdorp, *Rodin* 3852 (PRE).

SWAZILAND. Mbabane distr: Mbabane, *Rogers* 11625 (BOL); Boundary between Mbabane and Manzini distrs: Malkerns, *Compton* 27363 (SGH); Manzini distr: Little Usutu river, *Compton* 28469 (SGH); Mankiana distr: Mankiana village, *Gordon-Gray* 6015 (NU, SGH); districts unknown: Komati Pass, *Compton* 31301 (SGH, PRE); Kirkhill, *Compton* 25757 (SGH, PRE).

NATAL. Ingwavuma distr: n.e. Lake Sibayi, *Tinley* 92 (NPGF); Newcastle distr: Cundy Cleugh Pass, *Skead & Ward* 8 (NPGF, NU); Vryheid distr:

Hlobane, *Johnstone* 341 (NU, PRE); Hlabisa distr: Hluhluwe Game Reserve, *Ward* 1678 (NPGF, NU); Dundee distr: 5 miles e. of Sundays river on Helpmekaar road, *Edwards* 2380 (PRE, NU); Klip River distr: Klip river near Wessel's Nek, *Acocks & Pentz* 10257 (NH, PRE); Bergville distr: Cathedral Peak Forestry Station, Mlambonja Valley, *Killick* 2343 (PRE); Estcourt distr: Monk's Cowl, Cathkin, *Killick* 2323 (PRE); Eshowe distr: Umlalazi, *Medley Wood* s.n. (NH); Mtunzini distr: Port Durnford Lighthouse, *Ward* 4011 (NPGF, NU, PRE); Mapumulo Distr: Umvoti Valley, s.w. of Mapumulo, *Moll* 1576 (NU, PRE); Lion's River distr: Balgowan, Glen Arum, *Mogg* 3853 (PRE, GRA); New Hanover distr: Albert Falls, *Comins* 223 (NU); Pietermaritzburg distr: Pietermaritzburg, Town Hill, *Huntley* 502 (NU, M); Camperdown distr: Nagle Dam, *Wells* 1277 (PRE, NU); Durban distr: near Durban, *Medley Wood* 6012 (NH); Umlazi distr: Louis Botha Airport area, Reunion, *Bayer* s.n. (NU); Port Shepstone distr: Oribi Flats, *McClean* 388 (PRE, NU); without precise locality: *Buchanan* 81: 118: 339 (K); *Buchanan* 338 (PRE); *Bews* 38 (NU).

CAPE PROVINCE. Umzimkulu distr: near Clydesdale *Tyson* 1191 (NBG, BOL, K); Bizana distr: near Sea View on Port Edward—Redoubt road, *Huntley* 763 (NU); Port St. John's distr: Isinuka, Flanagan 2609 (NBG, PRE); Mqanduli distr: Tembuland, Umtata river below 1,000 ft. *Drège* s.n. (K); Kentani distr: Kentani, *Pegler* 1090 (GRA, BOL, NBG).

In Africa the species is also known to occur in Angola (Rendle, 1899), but no specimens from this province have been seen.

WORLD DISTRIBUTION

MALAGASY. Ambohimanga pries du Tananarive, *Bosser* 13792 (PRE); Gorges du Manambolo, *Decary* 7902 (PRE); Analabe (N. de Tananarive) *Bosser* 5182 (PRE).

The species is also known from Mauritius, India, Malaysia, China, Japan, N. Australia, Polynesia, the Sandwich Islands, Tropical and Temperate America and Southern Europe. Clarke (1898) reported that it was to be found in, "All tropical and warm temperate regions."

It is not surprising that so abundant and widespread a sedge should be listed as a weed and should have had, when most narrowly diagnosed, some 140 names applied to it (Clarke, l.c. p. 201). Many infra-specific taxa have been recognised within *F. dichotoma* to which Koyama (1961) added a subspecies and a variety.

In Southern Africa, *F. dichotoma* is commonly to be found, from mid to late summer, in the damp mud of river and stream-banks, vleis and seepages and the damp washes of drainage ditches along roadsides. Isolated plants, never forming dense stands, are occasional in damp grassveld, sometimes far

from the nearest streamlet or vlei. Such plants are usually shorter and more compact than those occupying more hygrophilous situations in which there is greater competition for light among taller associates: their inflorescences are also often markedly reduced in size, degree of branching and number of spikelets.

In early spring, in areas where in summer it is in abundance, *F. dichotoma* can be detected only by the presence of the previous year's inflorescences that remain attached to the old plants, a few only of which survive. Achenes germinate in quantity among the dead plants producing seedlings that are flowering within three to four months.

Brain (1934) stated ". . . the fertile glumes appear white margined owing to the presence of cilia." Occasionally the sterile glumes develop a few short hairs forming a poorly defined ciliate fringe; otherwise margins are uniformly glabrous, but an extremely narrow pallid membranous margin gives the impression of a white edged glume.

Clarke (1898) cited Rehmann 7714 as from Houtbosch, Transvaal, but stamped on the sheet is "Natal—Camperdown."

Kunth (1837) described *Fimbristylis dregeana* (type Drège, between Umtentu and Umzimkulu Rivers, Pondoland, Transkei) which, apart from slightly broader more shining spikelets, shows close affinity with *F. dichotoma*. Detailed study revealed characters relating Kunth's type to other specimens regarded as putative hybrids between *F. dichotoma* and *F. ferruginea*. These are dealt with later in this paper.

4. *Fimbristylis bisumbellata* (Forsk.) Bub. in Dodec: 30 (1850); Fischer in Bull. Misc. Inf: 149 (1935); Hutch. in Fl. W. Trop. Afr. II (2): 476 (1936); Nelmes & Bald. in Am. Jour. Bot. 39 (6): 377 (1952); Kern in Blumea 8 (1): 135 (1955); Koyama in Journ. Fac. Sci. Univ. Tokyo III, 8 (3): 113 (1961); Podlech in Prod. Südwestafrika 165: 23 (1967). *F. dichotoma* (L.) Vahl in Enum. Pl. 2: 287 (1806) pro parte; Nees in Linnaea 9: 290 (1834) name only; Kunth in Enum. Pl. 2: 225 (1837) pro parte; A. Rich. in Tent. Fl. Abyss. 2: 504 (1839–43); Boeck. in Peters Reise n. Mossam. 2: 544 (1862–4) and in Linnaea 37: 12 (1871) pro parte; Clarke in Hook. Fl. Brit. Ind. 6: 635 (1893) and in Dur. & Schinz, Conspect. Fl. Afr. 5: 602 (1895); K. Schum. in Engl. Pfl. Ost. Afr.: 124 (1895); Dur. & Schinz in Etudes Fl. Congo 1: 300 (1896); Clarke in Dyer Fl. Cap. 7: 200 (1898), in Dyer Fl. Trop. Afr. 8: 417 (1902) and in Bull. Misc. Inf., Addit. Ser. 8: 107 (1908) name only; de Wild. in Pl. Bequaert. 4: 204 (1927); Cherm. in Cat. Pl. de Madag. Mem. Acad. Malgache: 31 (1931); Brain in Proc. Rhod. Sc. Assoc. 33: 85 (1934); Peter in Fedde Rep. 40: 402 (1936–7); Cherm. in Fl. de Madag. (Cyperaceae): 177 (1937).
Scirpus umbellatus Forsk. in Fl. Aeg.-Arab. 1: 15 (1775).

Annual, erect, up to 46 (usually 10–26) cm in height, generally densely

tufted: *rhizome* visible only when shoots broken apart, up to 2 mm wide: *leaf sheaths* flattened to terete, entire when young, soon splitting from mouth to spread from shoot; densely white velutinous to pilose except at extreme base, keel flat to slightly rounded, occasionally projecting, membranous portion faintly many nerved, mouth sloping, inconspicuously white ciliate; *ligule* 0; *blades* always developed, up to 15, (generally 3—7) cm long, 1.0—2.8 mm broad, falcate, occasionally straight, glabrous to glabrescent adaxially sometimes becoming pilose towards sheath mouth, but hairs not aggregated to form a ligule, glabrescent to pilose abaxially, apex obtuse to acute: *flowering stems* generally slightly flattened, glabrous: *inflorescence* up to 7.2 cm long, up to 6.5 cm wide, a dense compound “umbel” of $\pm$ 175 spikelets, occasionally laxer due to reduction to 30—40; *pedicels* up to 4 cm. long; *bracts* 2—4, usually 3 well developed, equalling, slightly exceeding or shorter than inflorescence, sheaths with keel glabrescent, membranous portion white velutinous, blades leaf-like, glabrescent: *spikelets* 3—11 mm long, 1.2—1.6 mm broad, compact, polygonal, markedly angled by projecting glume keels, elliptic, lanceolate or oblong when young, lanceolate-oblong, occasionally elliptic in age, light to

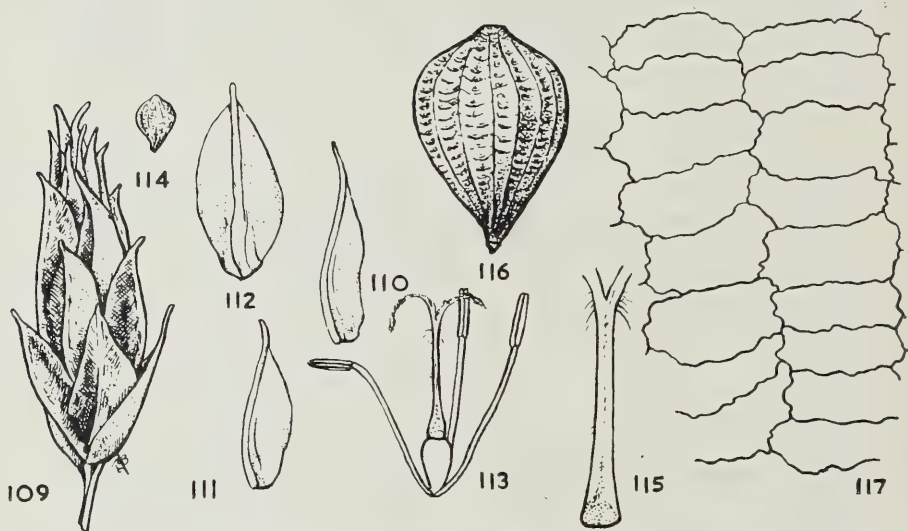


FIG. 9. *Fimbristylis bisumbellata* (Forsk.) Bub. (Codd 5722).

109—spikelet; 110–1—two lowest glumes of spikelet; 112—fifth glume from spikelet base; 113—young floret; 114—achene (all $\times$ 7); 115—style base and style ($\times$ 14); 116—achene ($\times$ 28); 117—epidermal pericarp cells ($\times$ 196).

golden brown with conspicuous green to cream nerves: *rachilla* nude: *glumes* delicate, lowest 1—2 sterile, bract-like, remainder fertile, 1.5—2.0 mm long, 0.95—1.3 mm in total width, ovate-oblong, pallid to golden yellow with delicate, narrow membranous margin, glabrous, keel markedly projecting, green to pallid, of 3 veins excurrent into well marked mucro, apex rounded, mucronate: *stamens* generally 1, occasionally 2 or 3 (all possibilities may occur within a spikelet); *anthers* 0.4—0.6 mm long, yellow to pale brown, apex rounded, obscurely crested: *style* 0.9—1.3 mm long including style base, approximately 0.08 (never attaining 0.1) mm wide, thread-like, slightly flattened in plane of achene, margins villous in upper half, style base deltoid, branches 2: *achene* 0.65—0.8 mm long, 0.4—0.6 mm wide, obovate, pale yellow to silvery white, surface with 5—8 prominent longitudinal ridges, trabeculate. Otherwise as *F. dichotoma* including outermost cells to pericarp.

Flowering period. Known to extend from August to January inclusive.

TYPE: Forskal s.n. (BM). "In locis litoreis in undatis insularum Niloticarum."

SELECTED CITATIONS

KENYA. Bura. Tana river, *Thain* 28 (PRE).

TANZANIA. Morogoro distr: Bwakira ya-ju, *Haarer* 1845 (EA); Rufiji distr: without precise locality, *Musk* 15 (EA); Usaramo distr: Usambara, banks of Pangani river, Mauri, *Greenway* 4020 (EA); distr. unknown: am Tigifluss bei Languza, *Peter* 8249 (EA).

ZAMBIA. Batoka distr: Livingstone, n. bank of Zambesi river, *Rogers* 13001 (BOL, GRA); Victoria Falls, Palm Island, *Wild* 3118 pro parte (SRGH); Mapanza, *Robinson* 354 (EARO).

MALAWI. Chickwawa distr: *Brass* 17936 (PRE).

MOZAMBIQUE. Macondes distr: near Rovuma river, *Pedro & Pedrogao* 5332 (LMJ, NU); Boruma distr: margins of Luenha river at confluence with Cuaredsi river, *Pedro & Pedrogao* 8188 (LMJ); Chimoio distr: Picada do Inchope at junction of Revue and Muda rivers, *Gomes Pedro* 4532 (PRE); Sabie distr: Ressano Garcia, *Schlechter* 11884 (BOL, GRA).

RHODESIA. Lomagundi distr: Urungwe, junction Sanyati and Fulechi rivers, *Phipps* 743 (PRE); Mtoko distr: Mkota Reserve, Mazoe river, *Wild* 2694 (SRGH); Hartley distr: Renje, Umniati river, *Whellan* 101 (SRGH); Bubi distr: Gwampa Forest Reserve, Bubi river, *Goldsmith* 24/56 (NU); Umtali distr: *Drummond* 4865 (PRE); Ndanga distr: Lundi river, Chiquanda Pools area, *Goodier* 617 (PRE).

SOUTH WEST AFRICA. Kunene river, *Story* 5834 (PRE); Namaqualand, banks of Orange river near Abbasas, *Pearson* 2996 (BOL); Great Namaqualand, Ai Ais, banks of Great Fish river, *Thorne* s.n. (NBG).

TRANSVAAL. Zoutpansberg distr: junction Pafuri and Limpopo rivers, Codd & Dyer 4633 (PRE); Nelspruit distr: Sand river, 3 miles e. of Skukuza Codd 5722 (PRE).

NATAL. Ingwavuma distr: Ndumu Game Reserve, Ward 3152 (NPGF, NU); do. Tinley 529 (NPGF, NU); 840 (NU).

In Africa the species is also known to occur in West Tropical Africa (Hutchinson, 1936), but no specimens from this region have been seen.

WORLD DISTRIBUTION

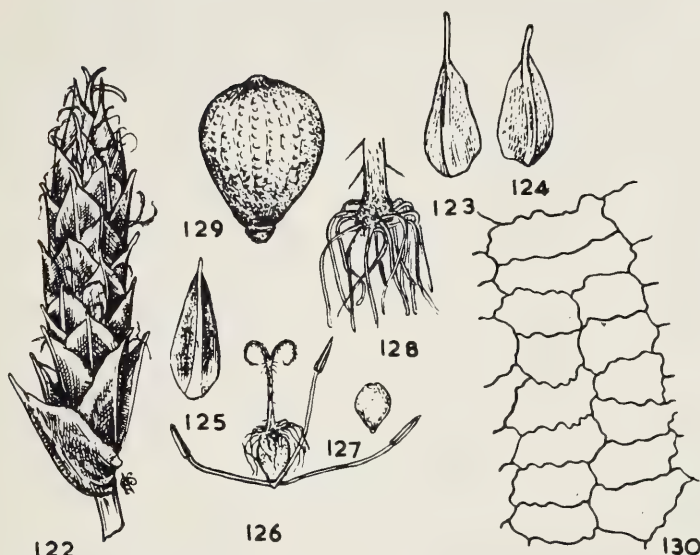
MALAGASY. Without precise locality, Decary 8299 (PRE). The species is also known from Reunion, India, Malaysia, Japan, Phillipine Islands, Australia and Southern Europe.

This tropical species is usually described as a weed. In Africa, south of the Zambesi river, *F. bisumbellata* has spread wherever the climate is tropical rather than temperate. It usually grows in sand, sand-clay or loam-clay soils, on banks and islands of rivers, or fringes of pans and hot springs. Zeyher 1779 is cited by Clarke (1898) as a mixed gathering, in part *F. squarrosa*, in part *F. bisumbellata* [= *F. dichotoma*]. The sheets of this number (K, PRE, NBG) seen during the present study have consisted entirely of the former species. If Clarke's citation of part of the gathering as *F. bisumbellata* is correct, then particular interest attaches to it, for the locality, "on the right side of the Olifants river from Vredendal to the mouth of the river", is southernmost in Africa: nor has the plant been recollected from there since 1830.

5. *Fimbristylis squarrosa* Vahl in Enum. **2**: 289 (1806); Roem. & Schult. in System. Veget. **2**: 96 (1817); Kunth in Enum. Pl. **2**: 224 (1837); Steud. Syn. Pl., Glum. **2**: 110 (1855); Boeck. in Linnaea **37**: 10 (1871); Ridl. in Trans. Linn. Soc., Ser. II, Bot. **2**: 149 (1884); Clarke in Hook. Fl. Brit. Ind. **6**: 635 (1893) and in Dur. & Schinz, Consp. Fl. Afr. **5**: 609 (1895); Dur. & Schinz in Etudes Fl. Congo **1**: 303 (1896); Clarke in Dyer Fl. Cap. **7**: 200 (1898); Rendle in Cat. Afr. Pl. Welw. **II** (1): 122 (1899); Clarke in Dyer Fl. Trop. Afr. **8**: 413 (1902), in Bull. Misc. Inf. Addit. Ser. **8**: 107 (1908) name only and in Illustr. Cyp. t. 41 f. 9-10 (1909); de Wild. in Pl. Bequaert. **4**: 207 (1927); Cherm. in Cat. Pl. de Madag. Mem. Acad. Malgache: 33 (1931); Hutch. in Fl. W. Trop. Afr. **II** (2): 474 (1936); Cherm. in Fl. de Madag. (Cyperaceae): 176 (1937); Kern in Blumea **8**, (1): 143 (1955); et in Reinwardtia **6**, i: 48 (1961); Raymond in Dansk. Botanisk. Arkiv. **23**, 3: 339 (1966); Podlech in Prod. Südwestafrika 165: 24 (1967). *F. ecklonii* Nees in Linnaea **9**: 290 (1834) name only and in Linnaea **10**: 145 (1835); Kunth in Enum. Pl. **2**: 226 (1837).

Pogonostylis squarrosa (Vahl) Bertol. in Fl. Ital. **1**: 312 (1833).

Annual, erect, up to 33 cm in height, generally densely tufted: *rhizome* visible only when shoots broken apart, 2—3 mm wide: *leaf sheaths* terete, entire

FIG. 10. *Fimbristylis squarrosa* Vahl (Bayer 1503).

122—spikelet; 123—two lowest glumes of spikelet; 124—two lowest glumes of spikelet; 125—fifth glume from spikelet base; 126—young floret; 127—achene (all $\times 7$); 128—style base ($\times 14$); 129—achene ($\times 28$); 130—epidermal pericarp cells ($\times 196$).

when young soon splitting apically to spread from shoot, white velutinous to pilose, keel rounded, slightly projecting, membranous portion faintly many nerved, mouth sloping, occasionally almost truncate, inconspicuously white ciliate; *ligule* 0; *blades* up to 18 cm long, 0.5–1.2 mm broad, erect, occasionally almost flexuous, glabrous to pilose adaxially, pilose to velutinous abaxially, apex acute: *flowering stems* glabrous: *inflorescence* up to 6.5 cm long, up to 6.0 cm wide, a more or less dense compound “umbel” of ± 53 spikelets; pedicels up to 35 mm long; *bracts* 3–4, usually 3 well-developed, equalling, slightly exceeding or shorter than inflorescence, leaf-like: *spikelets* 5–13 mm long, 1.0–2.0 mm broad, otherwise as *F. bisumbellata*; *rachilla* minutely winged: *glumes* delicate, lowest only sterile, bract-like, remainder fertile 1.9–2.2 mm long (including acumen), 0.8–1.3 mm in total width, ovate-oblong to oblong, golden yellow to pallid at base and at delicate, membranous margin, upper glabrous, lower pilose to glabrescent, keel as for *F. bisumbellata*, but mucron better developed, 0.2–0.7 mm long: *stamen* 1 only; *anther* 0.4–0.6 mm long, pale brown, crest darker: *style* 0.7–1.2 mm long including style

base, 0.14 mm wide, 1-nerved, slightly flattened in plane of achene, margins long villous in upper half, hairs pendulous, style base deltoid, margins white villous hairs forming a dense fringe across achene face, falling with style, branches 2: *achene* 0.6—0.8 mm long, 0.3—0.55 mm wide, obovate, pale yellow, surface often appearing smooth, but faintly reticulate or longitudinally striate and trabeculate: *outermost cells to pericarp* subquadrate to transversely elongate, scattered, occasionally in longitudinal series.

Flowering period. Known to extend from October to January inclusive.

TYPE: Herbarium Vahlia (C) probably collected by Loeffling in S. America (Ortega).

SELECTED CITATIONS

TANZANIA. Rufiji distr: without precise locality, *Musk* 14 (EA).

ZAMBIA. Mongu distr: Zambesi river, Sandula Pontoon, *Drummond & Cookson* 6369 (SRGH, NU); Batoka distr: Livingstone n.w., *Robinson* 1449 (EARO).

MOZAMBIQUE. Manica-Sofala distr: Gorongosa Game Reserve, banks of Urema river, *Chase* 6982 (PRE); margins of Macaranga lagoon, *Pedro & Pedrogao* 8973 (LMJ).

RHODESIA. Mazoe distr: Henderson Research Station, conservation dam, *Crass* s.n. (NU); Bulawayo distr: Hillside dam, *Miller* 3681, 3252, 4793 (PRE); 7082 (SRGH, NU).

SOUTH WEST AFRICA. Ovamboland, Banks of Kunene river near Ruacana Falls, *de Winter* 3659 (PRE).

BOTSWANA. Ngamiland, without precise locality, *Curson* 827 (PRE).

TRANSVAAL. Zoutpansberg distr: towards Lake Fundusi, *Hutchinson* 2197 (PRE).

NATAL. Lower Umfolozi distr: Richard's Bay, *Bayer* 1503, 1505 (NU).

CAPE PROVINCE. Clanwilliam distr: Doorn River, *Drège* s.n. (K); van Rhynsdorp distr: Ebenezer, near Olifants river, *Drège* s.n. (K, NBG); in humidis ad Olifants river, *Ecklon & Zeyher* 73 (GRA); on the right side of Olifants river from Vredendal to the mouth, *Zeyher* 1779 (K, PRE, NBG).

The above description and citations refer to var. *squarrosa*, which is also reported for West Tropical Africa (*Hutchinson*, 1936), Angola (*Ridley*, 1884), the Congo (*Dur. & Schinz*, 1896) and N. Africa (*Koyama*, 1961), but no specimens from these regions have been seen.

WORLD DISTRIBUTION

MALAGASY. Environs da Tananarive, *Bosser* 14935 (PRE); do. *Decary* 6854 (PRE). var. *squarrosa* is also known from S. Europe, India, Korea, Japan, China, N. Indo-China and S. America.

A second variety, *esquarrosa* Makino, with shorter mucronate glume apices is recognized. Kern, 1961, and Raymond, 1966, record it from Tropical Africa, but the few Tropical African specimens I have seen have all belonged to the typical variety.

Kern (1955) commented on the intimate relationship between *F. squarrosa* and *F. aestivalis* (Retz.) Vahl (which two species F. von Mueller (1875) united) and emphasized that their only reliable point of difference was the presence of long trichomes to the style base in the former that are absent or very short in the latter. Koyama (March, 1961) followed von Mueller and recognized *F. squarrosa* at varietal status only. Kern (Sept., 1961), despite his previous statement, again recognized both species and again commented on their close affinity. Raymond (1966) followed Kern without reference to Koyama's arrangement.

Worthy of further consideration in this connection is the following: Clarke 1895, 1898 cited *Cyperus hirtus* Thunb. in Phytogr. Blaett 1: 6 (1803) and in Fl. Cap. 1: 378 (1811) as a synonym under *Fimbristylis exilis* (Willd.) R. & S. Investigation in Thunberg's Herbarium (Bot. Mus. Univ. of Uppsala) showed the only sheet named *C. hirtus* (in Thunberg's hand) carries three specimens 35—50 mm in height that are in good agreement with Southern African specimens of *F. squarrosa* except that spikelets and floral parts are smaller and the hairs to the lower edge of the style base merely form a short fringe and do not overhang the upper half of the achene. On the reverse of the sheet, also in Thunberg's hand, is the note "e Cap. b. Spei, Osbeck". Thus Thunberg did not collect the plants himself, but obtained them from P. Osbeck, later Dean, who travelled to China in a Swedish ship as sea-chaplain in the years 1750–1752. In his "Journal of a Voyage", Osbeck does not mention going ashore along the southern African coast, but does mention visiting Ascension. The locality of his material is thus possibly this island.¹ These specimens are probably *F.*

I am indebted to C. G. Alm, Institute of Systematic Botany, University of Uppsala, for the information concerning Osbeck and for arranging the loan of Thunberg's specimen.

squarrosa var. *esquarrosa*, or they may be better placed with *F. aestivalis*. Without study of a range of material of both variety and species such a decision is difficult, especially as it has consequences. If Osbeck's plants are considered as var. *esquarrosa*, *C. hirtus* Thunb. antedates *F. squarrosa* Vahl, the valid name for which should then become *F. hirta*, provided Hooker, Bonpland and Kunth's type of *Isolepis hirta* (Nov. Gen. et Sp. 1: 224 (1813)) is *F. squarrosa* which synonymy and specimens from the same approximate locality suggest. Of course, if Osbeck's plants are placed with *F. aestivalis*, or if this species is definitely conspecific with *F. squarrosa*, then *F. aestivalis* remains the oldest, valid name for the taxon.

Since I have not examined Retzius' type of *Scirpus aestivalis*, and since I am insufficiently familiar with this species over its range of distribution, I prefer to retain the Southern African plants under *F. squarrosa* var. *squarrosa*, pending further study.

In Southern Africa this variety is always to be found near water, either favouring the same habitats as *F. bisumbellata* (a number of mixed gatherings are on record), or in the sandy, saline soils of lagoons and coastal mudflats, where it is one of the earliest colonizers.

6. *Fimbristylis ferruginea* (L.) Vahl in Enum. Pl. 2: 291 (1806); Kunth in Enum. Pl. 2: 236 (1837); Boeck. in Peters Reise n. Mossam. 2: 544 (1862-64) and in Linnaea 37: 16 (1871); Bak. in Fl. Maur. 419 (1877); Ridl. in Trans.

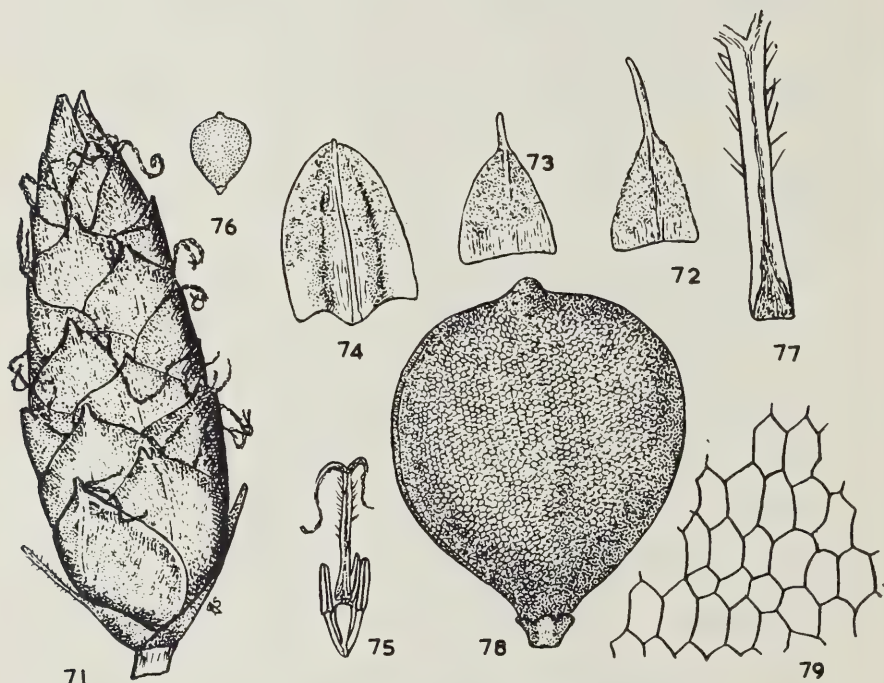


FIG. 11. *Fimbristylis ferruginea* (L.) Vahl (Ward 2125).

71—spikelet; 72-3—two lowest glumes of spikelet; 74—fifth glume from spikelet base; 75—young floret; 76—achene (all $\times 7$); 77—style base and style ($\times 14$); 78—achene ($\times 28$); 79—epidermal pericarp cells ($\times 196$).

Linn. Soc., Ser. II, Bot. 2: 149 (1884); Clarke in Fl. Brit. Ind. 6: 638 (1893); Schwein. in Bull. Herb. Boiss. 2, Append. 2: 51 (1894); Clarke in Dur. & Schinz, Consp. Fl. Afr., 5: 606 (1895); K. Schum. in Engl. Pfl. Ost. Afr. 124 (1895); Dur. & Schinz in Etudes Fl. Congo 1: 302 (1896); Clarke in Bull. Herb. Boiss. 4, Appen. 3: 31 (1896) and in Dyer Fl. Cap. 7: 201 (1898); Rendle in Cat. Afr. Pl. Welw. 2: 122 (1899); Clarke in Dyer Fl. Trop. Afr. 8: 417 (1902) and in Bull. Misc. Inf., Addit. Ser. 8: 108 (1908) name only and in Illustr. Cyp., Tab. XLII, f. 9 and 10 (1909); Burt Davy & Leerndertz-Pott in Ann. Tvl. Mus.: 132 (1912) name only; de Wild. in Pl. Bequaert. 4: 206 (1927); Dyer in Notes on Cyp. Albany and Bathurst Divs: 478 (1927); Cherm. in Cat. Pl. de Madag. Mem. Acad. Malgache: 31 (1931) including var. *sieberiana*; Brain in Proc. Rhod. Sc. Assoc. 33: 85 (1934); Hutch. in Fl. W. Trop. Afr. II, 2: 474 (1936); Peter in Fedde Rep. 40: 402 (1936-7); Cherm. in Fl. de Madag. (Cyperaceae): 181 (1937) including var. *sieberiana*; Nelves & Baldwin in Am. Journ. Bot. 39, 6: 375 (1952); Mogg in Nat. Hist. Inhaca Is., Mocambique, ed. Macnae & Kalk: 141 (1958); Kern in Reinwardtia 6, 1: 45 (1961); Raymond in Dansk. Botanisk Arkiv. 23, 3: 334 (1966); Podlech in Prod. Südwestafrika 165: 24 (1967). *F. sieberiana* Kunth in Enum. Pl. 2: 237 (1837); Steud. in Syn. Plant. Glum. 2: 118 (1855); Kern in Blumea 8, 1: 131 (1955). *F. sieberiana* Kunth Podlech in Prod. Südwestafrika 165: 24 (1967).

Scirpus ferrugineus Linn. in Sp. Pl. ed. 1: 50 (1753) and in Sp. Pl. ed. 2: 74 (1762).

Biennial, sometimes annual or perennial, erect, up to 80 cm in height, sparsely to densely tufted, sterile shoots infrequent in mature plants: *rhizome* visible only when shoots broken apart, seldom exceeding 3 mm in width, persistent tunic of leaf bases usually lacking: *leaf sheaths* and *ligule* as in *F. dichotoma* except for the less well developed indumentum and more markedly projecting keel, so that in *F. ferruginea* sheaths are often glabrescent to pilose on membranous portion in upper half only, occasionally glabrous throughout; *blades* always developed, up to 31 cm long, 1.2—2.3 (1.78 ± 0.065) mm wide, linear, herbaceous, glabrous, almost glaucous in life, margins thickened to ridged, generally slightly involute, closely scabrid pubescent to smooth, apex broadly acute, often asymmetric, scabrid: *flowering stems* usually glabrous throughout, otherwise as in *F. dichotoma*: *inflorescence* up to 7.3 cm long, up to 3.4 cm wide, a compound or simple "umbel" of 16-4 spikelets, occasionally markedly reduced to a single head of sub-sessile spikelets; *pedicels* up to 3.5 cm long, glabrous; *bracts* 2-4, usually much exceeding, occasionally equalling or shorter than inflorescence, sheaths white pubescent, blade glabrous: *spikelets* 6-17 (12.25 ± 0.75) mm long, 3.0-5.0 (3.83 ± 0.10) mm broad, compact, cylindric, scarcely angled by glume keels, elliptic when young, oblong to lanceolate-ovate in age, obtuse to acute, ferruginous brown overlaid light grey, basal

glumes early deciduous; *rachilla* straight, deeply notched, showing spiral arrangement of glumes, shortly winged except at extreme base, wings acute to acuminate, ferruginous brown; *glumes* lowest 1–2 sterile, bract-like, remainder fertile, 3.2–4.9 (4.0 ± 0.09) mm long, 2.7–4.9 (3.72 ± 0.15) mm in total width, broadly ovate to orbicular, glabrous adaxially, grey velutinous in upper half abaxially, keel hardly projecting, of one green to brown vein excurrent into mucron, apex rounded, mucronate: *stamens* 3; *anthers* 1.08–1.6 (1.28 ± 0.08) mm long, yellow to brown, crest minute, smooth, reddish-brown, base minutely auricled: *style* 2.8–3.2 mm long including style base, 0.27–0.52 (0.37 ± 0.01) mm wide at narrowest point, ribbon-like, flattened in plane of achene, 1–3 nerved, margins long villous in upper two-thirds, glabrous below, style base generally not, occasionally very slightly exceeding style width, branches 2, as in *F. dichotoma*; *achene* 1.25–1.7 (1.48 ± 0.04) mm long, 0.7–1.3 (1.05 ± 0.04) mm broad, biconvex, obovate to almost orbicular, yellow, apex minutely projecting, surface faintly reticulate, gynophore developed; *outermost cells to pericarp* subquadrate (hexagonal), eventually velate.

Flowering period: October to May inclusive.

TYPE: Deposited in Linnean Herbarium, London. Linnaeus (1753) gave the type locality as, “in Jamaica paludibus maritimis”, but it is not known with certainty whether this applies to the specimen recognized as the type.

SELECTED CITATIONS

MAURITANIA. Sahara desert. Terjit (Adrar) *Naegele* 114 (PRE).

SOMALIA. Between Halin and Bihen, *Glover & Gilliland* 132 (EA).

TANZANIA. Usaramo distr: Dar-es-salaam, *Holst* 4193 (EA); Zanzibar, Chukwani, *Tait* 23 (NU).

ZAMBIA. Batoka distr: Mapanza n.w. *Robinson* 935 (EARO); East Loangwa distr: Msoro, 50 ml. w. of Fort Jameson, *Robinson* 848 (EARO).

MOZAMBIQUE. Portobelo distr: Quelimane, *Sim* 20746 (NU); Buzi distr: picada do Lonchope as R. Buzi, entre R. Revue e.o. R. Buzi, R. Rucuro, *Gomes Pedro* 4539 (PRE); Sul do Save, vale do Limpopo. *Myre* 1286 (LM, NU); Inhaca Island, Lighthouse fringe of n. shore, *Mogg* 26930 (PRE); sandveld near saltmarsh, *Mogg* 16703 (PRE).

RHODESIA. Darwin distr: Kendeya Nature Reserve, *Phipps* 2318 (SRGH, PRE); Binga distr: Chikwata Hot Springs, *Phipps* 1590 (PRE); Mazoe distr: Bindura, *Brain* 8028 (BUL, LMJ); Buhera distr: Sabi Valley, Honde dip, Whellan 254 (SRGH); Chipinga distr: e. Sabi, Upper Rupembe, *Phipps* 81 (PRE); Ndanga distr: Chipinda Pools area, *Goodier* 617 (SRGH, PRE); Gwanda distr: near Similala river, about 9 ml. w. of Fort Tuli on old road to Maklantsi, Tusi Circle, *Drummond* 6132 (SRGH, NU).

SOUTH WEST AFRICA. Okahandja distr: farm, "Gros Barmen", *Merxmüller & Giess* 1016 (PRE, M); prope Barmen, *Marloth* 1364 (PRE, GRA).

TRANSVAAL. Sibasa distr: Malathlapanga, near Sibasa, *van der Schyff* 5664, 5659 (PRE); Lydenburg distr: farm "Ironstone", *Barnard & Mogg* 822 (PRE, NU); Pretoria distr: near Wonderboom Poort, banks of Aapias River, *Labuschagne* s.n. (PRE); Pienaar's River, *Rehmann* s.n. (K); Bon Accord, 9 ml. n. of Pretoria, *Mogg* 12399 (PRE); Barberton distr: Rose's Creek, *Thorncroft* B2 (PRE).

SWAZILAND. Manzini distr: Bulunga Poort, *Compton* 31840 (SGH, PRE).

ORANGE FREE STATE. Without precise locality, *Buchanan* 145 (K).

NATAL. Utrecht distr: streamlet near Kingsley, *Gordon-Gray* 4995 (NU); Vryheid distr: near Vryheid, *Gordon-Gray* 4990 (NU); Ngotshe distr: Ngotshe bank of Nkuzana River between Nongoma and Magudu, *Gordon-Gray* 4762 (NU); Dundee distr: Dundee near Waschbank River, *McClellan* 88 (SRGH, PRE); Hlabisa distr: Hluhluwe Game Reserve, *Ward* 2125 (NU, NPGF); St. Lucia Estuary, Narrows, *Ward* 4371 (NU, IU); Klip River distr: Grobbelaar's Kloof near Colenso, Onderbroekspruit, *Acocks* 10012 (NH, PRE); Lower Umfolozi distr: Richard's Bay, *Bayer* 1507 (NU); Weenen distr: Weenen, Sun Valley Estates, *Basel* 61 (NU); Lower Tugela distr: Tugela Mouth, *Edwards* 1726 (PRE, NU); Inanda distr: Mount Edgecombe, *McMartin* 13 (NH, PRE); Durban distr: Durban Flat, *Buchanan* 55 (K, PRE); Port Shepstone distr: Port Edward, along beach towards Munster, *Huntley* 754 (NU).

CAPE PROVINCE. Lusikisiki distr: near mouth Umsikaba River, *Drège* s.n. (K); Port St. John's distr: Port St. John's, *Moss* 5509 (J); Elliotdale distr: The Haven, *Gordon-Gray* 404 (NU); Komgha distr: Kei Mouth, *Schlechter* 6192 (GRA, NBG); King William's Town distr: Pirie, *Sim* 917 (NU); East London distr: East London, *Ratray* 727 (GRA); Bathurst distr: near Fish River mouth, *Dyer* 3387 (PRE).

In Africa the species is also reported for Angola (*Rendle*, 1899) and West Tropical Africa (*Hutchinson*, 1936), but no specimens from these localities have been seen.

WORLD DISTRIBUTION

MALAGASY. Vavatohe, *Hildebrandt* 3321 (K); Antanimora, *Decary* 3810 (PRE).

The species is also known from Mauritius, India, Australia, the Lesser Sunda Islands (Timor), the Phillipine Islands (Mindanao) (*F. sieberana*) Malaysia and Tropical America (*F. ferruginea*).

Kern (1955) upheld Kunth (1837) in segregating from *F. ferruginea*, the closely allied *F. sieberana* mainly on the basis of differences originally expressed by Kunth (Table 1). Kern regarded *F. sieberana* as "a well characterized

species", but this was not the opinion of workers who had dealt with the taxa in other parts of the world. Thus Clarke (1898) cited *F. sieberana* as a synonym of *F. ferruginea*, while Chermeson (1937) cited both *F. ferruginea* and its variety *sieberana* for Malagasy. According to Kunth, *F. sieberana* is to be found at the Cape of Good Hope (known distribution shows the species to extend no further south than the Great Fish River, however), but study of Southern African plants in field and herbarium, with particular attention being given to characters considered critical by Kern, has shown these plants to link this species with *F. ferruginea*. The description of *F. ferruginea* in the present paper shows that while the means and standard errors of the means tend towards Kern's parameters for *F. sieberana*, extremes show overlap with figures for *F. ferruginea*. In addition, individual plants frequently show certain features of Kern's *F. sieberana* associated with others of his *F. ferruginea*. Consequently both taxa could not be maintained, and Southern African plants are here named *F. ferruginea* with *F. sieberana* considered synonymous. I have not, however, examined Kunth's type in the Willdenow herbarium.

F. ferruginea is most easily diagnosed by the short, fine, grey adpressed pubescence on the abaxial surface in the distal half of the glume. Despite Clarke's (1898) comment, ". . . but the glumes are occasionally absolutely glabrous", no such specimens have been seen except that show other evidence of hybridization.

Brain (1934) described the "umbel" as, "lax with usually 30-40 large, ferruginous spikelets which are usually variegated with yellow". This number of spikelets is excessive for the species, since in all specimens studied from south of the Zambesi River, including many from Rhodesia, no more than 16 spikelets have been found. Use of the word, "lax", is also an over-statement.

F. ferruginea always favours damp situations in sand and mud along river banks and in vleis that tend partially to dry during the unfavourable season. Particularly is the species common at the coast; in marshy places near lagoons; in crevices among rocks where soil is kept moist by water from streamlets or seepages; or in low-lying grassveld periodically inundated. There is tolerance of saline conditions, for plants may occur so close to the sea that they are affected by salt spray throughout the year and occasionally by waves at spring tide. In estuaries plants are also often subjected to inflow of sea water. Occasionally plants grow along rivers and stream banks considerable distances from the sea (Tugela river near Colenso; Bushman's river valley near Estcourt; Barberton district, Transvaal), generally where soils contain a high percentage of sand. Brain (1934) refers to the species in Rhodesia as, "a tall tufted perennial of red soils, attaining its greatest development in semi-vlei conditions".

F. ferruginea, like most species of the genus, is a heliophyte and intolerant of intense shade.

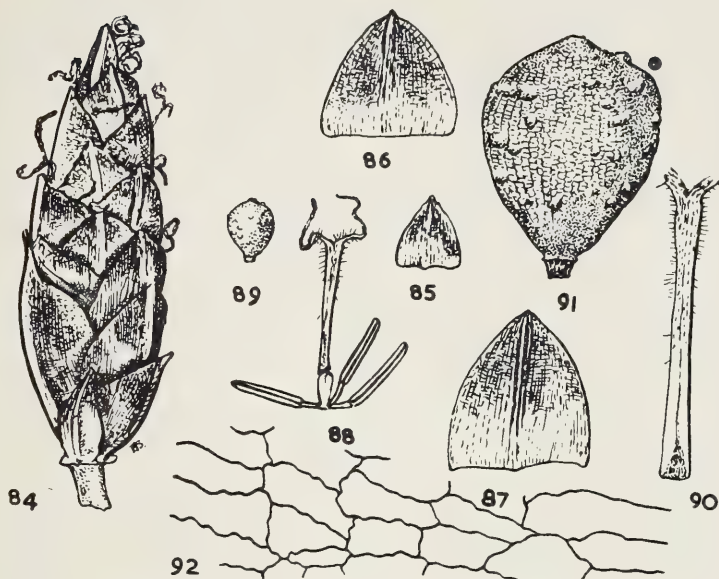


FIG. 12. *Fimbristylis longiculmis* Steud. (Boivin 1957).

84—spikelet with lowest glume removed; 85–6—two lowest glumes of spikelet; 87—fifth glume from spikelet base; 88—young floret; 89—achene (all $\times 7$); 90—style base and style ($\times 14$); 91—achene ($\times 28$); 92—epidermal pericarp cells ($\times 196$).

7. *Fimbristylis longiculmis* Steud. in Syn. Pl. Glum. **2**: 110 (1855); Clarke in Dur. & Schinz, Consp. Fl. Afr. **5**: 607 (1895); K. Schum. in Pfl. Ost. Afr.: 124 (1895); Clarke in Fl. Trop. Afr. **8**: 417 (1902) and in Bull. Misc. Inf., Addit. Ser. **8**: 108 (1908) name only; Cherm. in Cat. Pl. de Madag.: 32 (1931); Peter in Fedde Rep. **40**: 401 (1936–7); Cherm. in Fl. de Madag. (Cyperacees): 180 (1937). *F. sanzibarensis* Boeck. in Flora: 437 (1880).

The following description is based on tropical as well as Southern African specimens since so few populations are known south of the Zambesi River:

Perennial, erect, up to 135 cm in height, tufted; *rhizome* woody, up to 7 mm wide of shoot bases confluent in a uniseriate row or an irregular tuft, clothed by hard, acute scale leaves: *leaf sheaths* entire only when young, soon splitting apically to spread slightly from shoot, flattened, glabrescent, many nerved, keel not prominent, mouth truncate, white ciliate; *ligule* a dense fringe of white hairs; *blades*, up to 21 mm long, up to 1 mm wide, stiff coriaceous, each the apiculate continuation of main nerves of sheath, white pilose to glabrescent adaxially, glabrous abaxially, margins thickened, slightly involute, apex broadly

obtuse: *flowering stems* erect, compressed and 2-angled in young state and immediately below inflorescence, spongy, sometimes faintly transversely striate when dry, glabrous: inflorescence up to 10 cm long, up to 6 cm wide, a compound "umbel" of ± 30 spikelets; *pedicels* up to 8 mm long, as flowering stems; *bracts* 2—4, up to 11 mm long, poorly developed, shorter than inflorescence, coriaceous: *spikelets* 13—15 mm long, 3·2—5·0 mm wide, compact, cylindric, scarcely angled by glume keels, lanceolate to lanceolate-ovate when young, oblong in age, brown, usually shining, with green to fawn markings, apex acute, basal glumes early deciduous; *rachilla* straight, deeply notched showing spiral arrangement of glumes, dark brown, nude: *glumes* lowest 1—3 sterile, reduced, remainder fertile, 3·4—4·4 mm long, 2·8—4·4 mm in total width, broadly ovate to elliptic oblong, golden brown, darker speckled, glabrous, occasionally sparsely grey pubescent abaxially in distal half, keel poorly defined, of 5—6 closely placed veins, apex obtuse, mucronate: *stamens* 3; anthers 1·4—2·1 mm long, brown, crest minute: *style* 2·8—3·5 mm long including style base, 0·2—0·27 mm wide at narrowest point, ribbon-like, 3-nerved, margins long villous especially in upper half, pale to mid-brown, style base slightly exceeding width of style, branches 2, as in *F. dichotoma*: *achene* 1·1—1·2 mm long, 0·9—1·1 mm broad, similar to that of *F. ferruginea* except that it is obovate rather than orbicular, often darker brown and with a poorly developed gynophore, surface variously marked, reticulate, or longitudinally ridged and faintly trabeculate, markedly to sparsely tuberculate especially near ridges, occasionally etuberculate; *outermost cells to pericarp* subquadrate (hexagonal to rectangular) wider than deep, irregular or placed in longitudinal series, eventually velate.

Flowering period: September to March inclusive.

TYPE: Boivin 1657, collected January, 1848, Sainte-Marie, Malagasy (Madagascar) P.

SELECTED CITATIONS

TANZANIA. Mafia Island, Kilindoni, *Fitzgerald* 5211/5 (EA); Usaramo distr: Dar-es-salaam, *Holst* 4128 (EA); bei Dar-es-salaam *Peter* 44817 (EA); Zanzibar, without precise locality, *Kirk* s.n. (K).

MOZAMBIQUE. Homoine distr: Zandemela near Inhambane, *Lawrence* 2 (NBG); near Inhambane, region of Cumbane, *Gomes E. Souza* 2233 (PRE).

NATAL. Hlabisa distr: St. Lucia, eastern shores, *Feely* and *Ward* 16 (NPGF, PRE, NU).

WORLD DISTRIBUTION

MALAGASY. Central Malagasy, *Baron* 1363 (K); Ambilo (s. de Tamatave) *Decary* 6419 (PRE); Ahimena, Ampahana, Antalaha (NE), *Kiener* s.n. (PRE); without locality, *Gerrard* s.n. (K).

Clarke (1902) referred to *F. longiculmis* “. . . as though a very large form of *F. ferruginea*. It differs in the glumes being glabrous on the back and in the larger, harder, darker coloured spikelets”. Relationship between the two species is certainly close, but all specimens of *F. longiculmis* seen have been taller and more robust than is usual for *F. ferruginea*. In addition the flowering stems are coarse and spongy with transverse septations that sometimes become faintly visible externally on drying. This character, together with the reduction of leaf blades and inflorescence bracts, suggests the species grows in water for considerably longer periods than does *F. ferruginea*. Clarke's comment on the spikelets being glabrous on the back generally applies to herbarium material filed under *F. longiculmis*. In how far this is due to the identification of pubescent-glumed specimens as robust examples of *F. ferruginea*, is worthy of consideration. Peter 39370 and 39325 from Dar-es-salaam, Tanzania (EA) need re-appraisal in this connection in conjunction with field study of populations in the same locality.

Steudel, in describing the species, could not have seen fully mature fruits, for he concluded, “achenio—?”. Clarke (1902) described the nuts, “. . . as for *F. ferruginea*”. There is, however, much greater variation in sculpturing of the pericarp wall in *F. longiculmis* than within *F. ferruginea*. In addition the achenes are frequently tuberculate, but examples varying from markedly tuberculate to etuberculate occur, often a wide range being represented on a single plant.

HYBRIDS

The species considered in this paper are undoubtedly closely related. It is not surprising, therefore, that study of them in field and in herbarium has brought to light evidence of putative interspecific hybrids. In Natal and further south into the Transkei and the Cape Province, where, of the species under consideration, only *F. ferruginea* and *F. dichotoma* occupy a common distributional range, the putative hybrids show characters of both these species. Further north into Tropical Africa where *F. bisumbellata* is also widespread and occupies, in part at least, a common distributional area with the other already named taxa, putative hybrids between *F. bisumbellata* and *F. dichotoma* are also to be found. Clarke (1902), in dealing with Tropical African Cyperaceae, remarked, “*F. diphylla* (*F. dichotoma*) is so close to . . . *F. dichotoma* (*F. bisumbellata*) that different cyperologists sort the material, as between these two, differently.” Kern (1955) writing on Malaysian Cyperaceae, in which locality *F. bisumbellata* is extremely rare, stated, “Clarke, 1907, is of the opinion that *F. bisumbellata* is only distinguishable from *F. dichotoma* by characters of trifling importance. However, I always find the much smaller spikelets, the smaller, membranous, mucronate, sharply keeled glumes, the much shorter style, and the smaller nut sufficiently differentiating characters.” Ease of identification is dependent

upon the degree of morphological discontinuity among the taxonomic units under consideration. In the case of *F. dichotoma* and *F. bisumbellata* this discontinuity is sharply defined in the Malaysian and Southern African flora, but in Tropical Africa and India is blurred by the occurrence of many sporadic interspecific hybrids and possibly also hybrid swarms.

In Natal, where much field work has been carried out, no hybrid swarms between any two of the species under consideration have been encountered to date. The explanation for the occurrence of sporadic interspecific hybrids only, probably lies in the differing habitat requirements of the parental species, the intermediate habitats necessary for hybrids to succeed being generally poorly represented.

The sporadic hybrids are interesting, since besides exhibiting admixture of

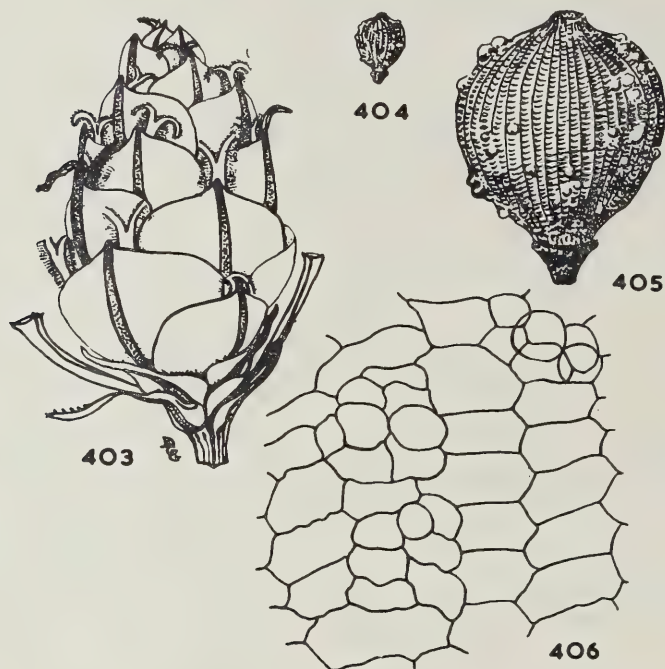


FIG. 13. *Fimbristylis* $\times$ *dregeana* Kunth. (pro species) (Drège, between Umtentu and Umzimkulu Rivers, Cape Province).
403—spikelet; 404—achene (both $\times 7$); 405—achene ($\times 28$); 406—epidermal pericarp cells ($\times 196$).



FIG. 14.

Mature achenes: top left—*F. ferruginea*; bottom left—*F. longiculmis* (both $\times 30$); top right—*F. bisumbellata*; middle right—*F. dichotoma*; lower right—*F. squarrosa* (all $\times 20$).

structural features of the putative parents, many of the achenes are tuberculate (etuberculate in the "pure" species). Such an example is the type of *F. dregeana* Kunth (Drège s.n., Pondoland, from between Umtentu and Umzimkulu rivers K. figs. 403–6) which carries tuberculate achenes of the approximate size of those of *F. ferruginea*, and with pericarp cells near the size for this species,

but of the shape of *F. dichotoma*. The spikelets are few and broad as in *F. ferruginea*, but with the glabrous glumes of *F. dichotoma*.

The association of tuberculation of the pericarp wall with hybridization needs confirmation from experimentation before it can be accepted, but repeated correlation of morphological evidence of interspecific hybridization with the development of tuberculate achenes is suggestive. Variation in the pericarp sculpturing and tuberculation of the achenes of *F. longiculmis* points to a possible hybrid ancestral origin for this species, *F. ferruginea* perhaps being one parent.

DISCUSSION

Attention has already been drawn to the closeness of relationships among the species considered in this paper. Despite this, and despite the occurrence of interspecific hybrids, identification of plants from localities south of the Zambesi river should seldom be difficult, provided observations are not cursory, for characters are usually well marked.

Grouping of the species into sections or series is not so straightforward, however. Doubts arise as to whether the present segregation of *Dichelostylis* from the type section *Fimbristylis* (Kern, 1955) on the basis of sculpturing of the external surface of the pericarp, is not too "fine" a distinction, especially when *F. longiculmis* with its variable achene surface, is included. Would not the union of both sections under the type name *Fimbristylis*, be more natural? A decision must await further evidence from other fields of investigation.

F. bisumbellata has not always been placed with *F. dichotoma* within section *Fimbristylis*, (following Kern l.c.). Ohwi, 1938, placed it with *F. squarrosa*, while Koyama, 1961, referred to its intermediate nature thus, "The smaller spikelets with lighter coloured scales, smaller achenes with less fimbriate style, and slender culms and leaves suggest that this is near to *F. squarrosa* as Ohwi (l.c.) treated. The ligule of a fringe of pubescence, however, shows that this species is also related to the *F. dichotoma* group." Examination of African specimens of *F. bisumbellata*, (with the possible exception of plants showing other characters indicative of hybridization with *F. dichotoma*) shows clearly that a ligule is lacking. Hairs at the base are often more densely packed than those higher on the leaf blade, but they are never aggregated into a definite fringe that constitutes a ligule. A difference in the texture and thickness of tissue between sheath apex and blade base is detectable, but this also cannot be interpreted as a ligule. This finding supports Ohwi's arrangement and serves to emphasize the many structural features that *F. bisumbellata* and *F. squarrosa* possess in common. Both species also behave as weeds readily colonizing exposed areas with suitable habitat conditions. *F. bisumbellata* should thus be included with section *Pogonostylis* rather than with *Dichelostylis* as Kern advocated.

KEY TO IDENTIFICATION

1. Faces of achenes covered in hairs pendant from style base: glumes long acuminate 5. *F. squarrosa* var. *squarrosa*.
 Faces of achenes naked, not covered in hairs pendant from style base: glumes rounded to mucronate, not long acuminate 2.
2. Achene surface clearly longitudinally ridged and trabeculate: leaf blades developed 3.
 Achene surface reticulate, not clearly longitudinally ridged and trabeculate (if faintly longitudinally ridged and trabeculate, then leaf blades reduced to apiculi terminating the sheaths) 4.
3. Spikelets 2—3 mm broad scarcely angled by projecting glume keels; rachilla ragged with wings of persistent tissue: style 0.15—0.28 mm wide at narrowest point 3. *F. dichotoma*.
 Spikelets 1.2—1.6 mm broad, markedly angled by projecting glume keels; rachilla naked, without wings of persistent tissue: style approximately 0.08 (never attaining 0.1) mm wide at narrowest point 4. *F. bisumbellata*.
4. Glumes grey pubescent abaxially in distal half; achenes etuberculate, obovate to orbicular with clearly developed gynophore; achene surface reticulate (epidermal pericarp cells hexagonal): flowering stems not spongy and coarse, never with transverse septa visible 6. *F. ferruginea*.
 Glumes glabrous, or sparsely grey pubescent abaxially in distal half; achenes usually tuberculate, especially near ridges, occasionally etuberculate, obovate with poorly developed gynophore; achene surface reticulate or faintly longitudinally ridged and trabeculate (epidermal pericarp cells subquadrate (hexagonal to rectangular, broader than long): flowering stems spongy and coarse, sometimes with transverse septa visible 7. *F. longiculmis*.

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TABLE I

Criteria used by Kern, 1955, to distinguish between *F. ferruginea* and *F. sieberana*.

<i>F. ferruginea</i>	<i>F. sieberana</i>
"Lower sheaths coriaceous, shining brown to castaneous, upper . . . ciliolate at the mouth, otherwise glabrous.	"Lower sheaths not coriaceous, stramineous to ferrugineous, upper . . . pilose especially towards the top, sometimes glabrescent.
Blades of the cauline leaves rigid, short, 2—10 cm long, $\frac{1}{2}$ —1 $\frac{1}{2}$ mm wide.	Blades of the cauline leaves grasslike, up to 35 cm long, $\frac{1}{2}$ —2 mm wide.

Involucral bracts usually shorter than the inflorescence.

Spikelets acute.

Glumes ovate to oblong, $3-4\frac{1}{2} \times 2\frac{1}{2}-3$ mm, puberulous in the apical part, ferruginous.

Style 0.25 mm wide.

Nut obovate to oblong—obovate, shortly stipitate, $1-1\frac{1}{4} \times \frac{3}{4}-1$ mm."

Lowest involucral bract usually overtopping inflorescence, up to 10 cm long.

Spikelets obtuse.

Glumes very broadly ovate, $3-4\frac{1}{2}$ mm long and wide, densely tomentose in the apical part, usually castaneous.

Style about 0.4 mm wide.

Nut broadly obovate to orbicular, distinctly stipitate, $1\frac{1}{4}-1\frac{1}{2} \times 1\frac{1}{10}-1\frac{1}{4}$ mm."